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ABSTRACT

Concerned with clarifying some of the more complex issues in drug abuse, the National Clearinghouse for Drug Abuse Information has prepared this special report on phencyclidine (PCP). Background information is provided through a summary of its history, legal status, and the opinions of authorities in the field. Significant research on the subject is presented together with major findings on various aspects of the problem. The pharmacology, chemistry, clinical effects (physiological, psychological, and behavioral), treatment, and patterns of use of the drug are dealt with. Bibliographic references are also listed. (BL)

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report series

NATIONAL CLEARINGHOUSE FOR DRUG ABUSE INFORMATION

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The National Clearinghouse for Drug Abuse Information recognized the need for clarifying some of the more complex issues in drug abuse by gathering the significant research on each subject and summarizing the major findings on various aspects of the problem. Report Series 11 through 18 deal with the pharmacology, chemistry, clinical effects, treatment and the patterns of use of each drug and provide a background in the area by outlining the history, legal status and the opinions of authorities in the field. These fact sheets were written and researched by the Student Association for the Study of Hallucinogens (STASH), Beloit, Wisconsin, under Contract No. HSM-42-71-26.

PHENCYCLIDINE (PCP)

Numerous psychoactive drugs originally prepared for legitimate therapeutic or research purposes have been recruited as "consciousness-expanding" agents by the drug using youth community. One such drug which has proved both fascinating and bewildering to researchers and users alike is phencyclidine (PCP), an animal tranquilizer freely used in animal hospitals and, therefore, easily diverted to "street" drug use. Because of its markedly different effects at varying dose levels, phencyclidine cannot be accurately placed in the "standard" stimulant, depressant or hallucinogenic categories of psychoactive drugs, although it acts pharmacologically like both an hallucinogen and a central nervous system stimulant. Interest in this drug developed from its unusual range of effects and its intended medical usage as contrasted to its abuse patterns on the street.

History, Chemistry and Pharmacology

Phencyclidine was developed in the late 1950's and following pharmacological, toxicological and metabolic studies in laboratory animals, it was recommended for clinical trials in humans in 1957. Parke, Davis and Company marketed the drug under the trade name Sernyl and received the U.S. patent for phencyclidine in 1963. Originally phencyclidine was utilized as an anesthetic agent in surgical procedures and, although it was found to be

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generally effective, the drug often produced unpleasant side effects. Some patients experienced upon emergence from anesthesia extreme excitement, visual disturbances and delirium. Other therapeutic investigations of phencyclidine included its potential use as an analgesic (pain killer) and in the treatment and research investigation of mental disorders. Because of the serious side effects and other problems with the drug, Parke-Davis, in a letter to the Food and Drug Administration on January 22, 1965, requested that further human clinical investigations be discontinued. In early 1967, phencyclidine became commercially available for "veterinary use only" under the trade name Sernylan, and in 1969, Parke-Davis acquired the production rights to Sernylan and is at present the sole distributor of the drug for legitimate purposes.

Phencyclidine, 1-(1-phenylcyclohexyl) piperidine HCl, is a white, stable solid with a melting point of 243-244°C and is readily soluble in water and in ethanol.

The site and mode of action of phencyclidine is as yet unclear although studies indicate that the drug acts on the sensory cortex, thalamus and midbrain in such a manner as to "scramble" internal stimuli thereby impairing perceptual functioning. The effects of phencyclidine upon the central nervous system (CNS) differ greatly among animal species and with varying dose levels. Whereas hyperactivity is more prominently observed in mice and rats, PCP tends to depress the CNS in higher species including man. In low doses (the exact effective dosage varies depending upon the route of administration) the drug produces a state resembling alcohol intoxication, including muscular incoordination and generalized numbness of the extremities. Analgesia and anesthesia occur at moderate dose levels characterized by sensory disturbances or blockade, muscular rigidity and, perhaps, loss of contact with one's environment. Large doses of the drug may produce convulsions.

Toxicity studies conducted at the research laboratories of Parke, Davis (Chen, Weston and Weston) revealed that the acute LD-50s (the lethal dose required to kill 50 percent of the animal population to which the drug is administered) for rats are: 179±0.40 milligrams per kilogram (mg./kg.) oral, and 15.9±0.6 mg./kg. intravenously. Chronic daily administration of phencyclidine of 1.0 mg./kg. orally or intravenously for 6 to 9 weeks was tolerated by dogs. Monkeys tolerated daily intravenous (i.v.) doses of 1.25 mg./kg. or an oral dose of 25 mg./kg. for the same time period.

Patterns of Use

The first reported "street" use of phencyclidine was observed in the Haight-Ashbury district of San Francisco in 1967 (Meyers, Rose and Smith) at which time the drug was illegally marketed as the PeaCe Pill. The drug-using community was apparently not happy with the effects produced by PCP; the Haight-Ashbury Free Medical Clinic reported that "use of the drug . . . [had] virtually ceased" by early 1968. In the summer of that year, a drug called "Hog" appeared in New York City and was identified as phencyclidine (Lindgren et al.). Although PCP had not proven to be a

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drug of choice among members of the "hippie" community, by 1969, it was being mislabelled and promoted as some other desirable psychedelic drug. This coincided with the general contamination of street drugs and camouflaging of one drug for another. PCP was often the principal ingredient in drugs marketed as LSD, cocaine and THC.

In October, 1970, five different varieties of "mescaline" sold in Milwaukee were analyzed (Reed and Kane). Four of these samples contained between 2 to 6 milligrams of phencyclidine, and the fifth sample was LSD. An analysis of alleged tetrahydrocannabinol (THC), the suspected active ingredient in marihuana, in the Philadelphia area and at rock concerts (Schnoll and Vogel) revealed that phencyclidine was the most commonly used compound in these samples. These findings have been routinely confirmed throughout the country.

Street use of PCP has been generally confined to oral ingestion or inhalation by smoking the drug as "Angel Dust," when it is sprinkled on parsley, marihuana or other smokable substances. Phencyclidine seems to be primarily synthesized in illicit laboratories, rather than diverted from legally produced supplies. It is produced in powdered form both alone and in combination with other drugs, often LSD, and is sold in gelatin capsules. The May-June, 1971, issue of the BNDD Bulletin reported that the Bureau's regional laboratory in Chicago analyzed multicolored capsules (blue, white and brown layers - the latter was intended to be red) to be PCP. This underground synthesis of PCP often produces a dangerous contaminated form of the drug. During the fall of 1970, a missynthesized batch of phencyclidine appeared in the Midwest. The compound was an extremely toxic substance which was reported to have produced abdominal cramps, vomiting and, in several individuals, coma and death (Reed and Kane).

Subjective Effects

Reported experiences under phencyclidine are mainly nondescript or unpleasant ones. In subanesthetic doses the experience usually proceeds in three stages: 1) changes in body image, sometimes accompanied by feelings of depersonalization; 2) perceptual distortions, infrequently evidenced as visual or audial hallucinations; and 3) feelings of apathy or estrangement. The experience often includes feelings of drowsiness, inability to verbalize and feelings of "nothingness" or "emptiness." Reports of difficulty in thinking, poor concentration and preoccupation with death ("meditatio mortis") are frequent. Many users have reacted to its use with an acute psychotic episode.

The following subjective accounts occurred under "normal" clinical settings. Luby et al. administered 0.1 mg./kg. of phencyclidine intravenously in 150 cc of 5 percent dextrose over a 12-minute period.

A subject reported:

> I feel far away; now I'm coming back. My arms and legs feel distant.

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A medical student recalled:

> Before I realized it, I was standing, but I didn't feel like I was standing. I didn't know where my feet were, and I didn't feel myself get up. I know I got up fast because my body felt light, just as though my legs didn't have much to support. When I began to walk, I didn't know where my feet were. I could feel my shoes on my feet, the pants around my legs, a slightly numb sensation like that in my arms, but I couldn't feel them move. . . . There were feelings of "selflessness," of not being human, and of being an "empty nobody." I am a small . . . not human . . . just a block of something in a great big laboratory.

Davies and Beech reported the effects produced by a low dosage level of phencyclidine in normal volunteers. One subject stated:

> The feeling was neither pleasant nor unpleasant but peculiarly indifferent. Whilst I retained some insight - I could not think clearly on abstract topics - my mental processes seemed slow and as well, there was an unwillingness to think, an indifference to the whole proceedings.

Studies in which a larger dosage of phencyclidine was given in a sensory deprivation setting indicate that the unpleasant experiences were markedly lessoned in effect. Pollard et al. (1965) administered phencyclidine orally (10 mg.) to college students. One student reported:

> This is a very strange drug. Doesn't produce images. I don't feel bad, I don't feel like I'm drowning, I don't feel normal. I just feel somewhere, but nowhere. I feel like I'm trying to wake up but it's such a long process, waking up.

Psychological Effects

The profound psychological changes associated with phencyclidine intoxication have been variously described and examined. Meyer et al. described the symptoms of sensory disturbance produced by the drug to resemble sensory deprivation. This contention was supported by Luby et al. who suggested that phencyclidine impaired the individual's ability to organize sensory input.

Rosenbaum et al. compared the effects of phencyclidine (0.1 mg./kg. intravenously), LSD (1 mcg./kg., orally) and amobarbital with amphetamine (500 mg. and 15 mg., intravenously) on attention (reaction time), motor performance (rotary pursuit test), and proprioception (weight discrimination test) in normal subjects. The pre- and post-drug test performance of the subjects were compared with those of chronic schizophrenics. Reaction times in a nonshock condition were markedly slower in the schizophrenics and in the phencyclidine-treated group.

The LSD and amobarbital groups displayed significantly faster reaction times. Under the impetus of shock, no significant differences were observed between the four groups. On the rotary pursuit test, the

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phencyclidine-treated group demonstrated a deficit in motor performance closely approximating the schizophrenics. LSD produced significant improvement in this activity while amobarbital produced essentially no change. On the weight discrimination test, the phencyclidine group again compared with the poor performance of the schizophrenics, but the LSD and amobarbital groups differed notably. The authors interpret the data to suggest that the primary symptoms of schizophrenia (attention and motor function deficits) and the effects produced by phencyclidine are related to disturbances in proprioceptive feedback.

Bakker and Amini studied the effects of phencyclidine on performance using a battery of psychological tests. Twenty-five prisoners received orally 5 mg. and 10 mg. of phencyclidine or a placebo. Significant decrements in performance as compared to controls were observed at both dose levels. The authors concluded that the drug produces a slowing of the functions necessary to perform the tasks presented in the test battery. This slowing was considered to be related to a "defense mechanism" to avoid making mistakes, as well as a direct action on the central nervous system. Impairment in performance is dose related as well as dependent upon the complexity of the task. Concentration, learning and memory functions were found to be severely disturbed.

Ban et al. compared the effects of 0.01 to 0.1 mg./kg. of phencyclidine administered intravenously with several other drugs in 55 psychiatric patients. Phencyclidine was found to aggravate pre-existing psychopathologies to a greater degree than the other drugs tested, including LSD and mescaline.

Twelve experimental (7.5 mg. orally) and six control subjects were tested for perceptual ability by Morgenstern et al. Perimetry, audiometry, visual acuity, taste threshold (quinine), two-point discrimination, touch and position sense were tested. The results appeared to support the theory that the symptoms produced by phencyclidine may be a result of partial sensory deprivation. Sensory disturbances were observed to occur well in advance of verbal reports of psychological changes.

Cohen et al. reported the findings of the second part of the study previously conducted by Rosenbaum. This part of the study was concerned with the effects of various drugs (phencyclidine, LSD and amobarbital) upon symbolic and sequential thinking. Only phencyclidine was found to approximate the inferior performance of schizophrenics on proverb interpretations and other similar tests. The findings were felt to be consistent with those reported by Rosenbaum.

Physiological Effects

Phencyclidine was administered (10 mg. in 100 cc. water intravenously) to 64 patients for anesthesia by Greifenstein et al. The drug did not depress circulation, respiration or disturb the cardiac rhythm, but a moderate slowing of the electroencephalographic (EEG) pattern of the brain was evident.

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Meyer et al. found that intravenous administration of 7.5 mg. of phencyclidine blocked the pain response of a pin prick; this was coupled with a slowed or attenuated response to sensory stimulation. At 9.5 mg., vertical nystagmus (involuntary eye movements) and drooping eyelids commonly occurred. After 10.5 mg., drowsiness was experienced; objects could no longer be identified by vision or touch, but motor movement was preserved. Intravenous administration of 0.25 mg. of phencyclidine produced a slight increase in respiration and diastolic and systolic blood pressure; however, pulse rate changes did not exhibit a consistent pattern.

Common peripheral signs of phencyclidine use include flushing, profuse sweating and mild relaxation of the arteries. Analgesia, nystagmus, muscular incoordination, double vision, dizziness (perhaps resulting in nausea and vomiting) may also occur.

Treatment of Acute Intoxication

There has not been very much experience with the acute treatment of PCP effects. Reed and Kane of the Milwaukee Free Medical Clinic suggest utilizing techniques similar to those used for adverse reactions to psychedelic drugs. "The more important of these are: a warm and non-threatening environment, one-to-one contact with an empathetic individual who would be capable of determining the deterioration of the individual's physical state, protection from self-harm, and the availability of hospital facilities." A comatose or convulsant patient needs general supportive care (respiratory assistance being unlikely) with, perhaps, the "judicious use of sedatives."

Legal Aspects

Phencyclidine is considered a controlled dangerous substance under the Comprehensive Drug Abuse Prevention and Control Act of 1970. Illegal possession of phencyclidine could result in a sentence to a term of imprisonment of not more than 1 year, a fine of not more than $5,000, or both. Conviction of illicit manufacture or sale could result in a sentence to a term of imprisonment of not more than 5 years, a fine of not more than $15,000, or both. Subsequent convictions would result in increased penalties.

Comments

Phencyclidine (PCP) has not been found to be a "drug of choice" by either the medical profession for therapeutic uses or the drug-using population for its subjective qualities. Generally, phencyclidine is sold on the street under the guise of another label such as THC (which has never really been available for street use).

> We desperately need to give our youth information about the risk factor in drugs. There's such a mythology they get; for example: The kids hear that THC (Tetrahydrocannabinol), the active ingredient in marihuana, is available in a capsule on the black market. It's phencyclidine, the peace pill, which is a veterinary anesthetic.

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> In other words, it makes dogs hallucinate, which is why it was never released for humans. That's what the kids are taking, and it's a very dangerous drug.
>
> -John Thomas Ungerleider, M.D.

The discomforting feelings (apathy and isolation) often produced by PCP are, perhaps, the most important factors in the drug experience.

> When the drug itself apparently serves to intensify these feelings of anomie, it would seem likely that the possibility of psychological harm due to the drug would be relatively great. While acute psychotic reactions due to the use of PCP have not, per se, been reported, it is quite possible that some such reactions attributed to other hallucinogens may have been actually due to PCP sold under the name of LSD or mescaline.
>
> -Alan Reed, M.D. & Andrew W. Kane, Ph.D.

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